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Applicant	:	CHEN, Hua	
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Examiner	:	VERDIER, Christopher M.	
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Date	:	April 16, 2010	

Mail Stop: Appeal Brief - Patents
Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Please consider the following appeal brief in the appeal of the above-identified application.

TABLE OF CONTENTS

I) REAL PARTY IN INTEREST

The real party in interest in this application is assignee HONEYWELL INTERNATIONAL, INC.

II) RELATED APPEALS AND INTERFERENCES

No appeal or interference known to Appellant or Appellant's legal representative will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III) STATUS OF CLAIMS

Claims 1, 4-6, 9 and 11-18 are pending in the application. Claims 1, 4-6, 9 and 11-18 have been finally rejected by the Examiner. Appellant has appealed the rejection of claims 1, 4-6, 9 and 11-18.

IV) STATUS OF AMENDMENTS

Appellant has not filed an amendment after final rejection. Claims 1, 4-6, 9 and 11-18 stand as they were prior to the Examiner's final rejection.

V) SUMMARY OF CLAIMED SUBJECT MATTER

In the operation of a typical radial compressor, a spinning wheel of compressor blades scoop in an axial stream of air and accelerate it radially outward to form a pressurized stream of air, such as for use by an automobile engine. The air is forced to remain within the effect of the blades by a shroud that closely conforms to the outer shape of the blades. If the flow through the blades is substantially blocked at the exit, such as might occur when an engine suddenly reduces in speed, the pressure level can build up, causing pressurized air to flow backwards through the wheel. This typically happens in short, repeating bursts known as surges.

The present invention provides a small structural change that can have a significant reduction in the occurrence of surge. It features a discontinuity in the form of a downstream-facing surface on the shroud at the downstream edge of the blades. The surface forms a sharp edge at its upstream (i.e., inner) end. As is described on second half of page 5 of the application, this surface provides an aerodynamic block to the reverse flow of air that occurs during a surge, and thus reduces the occurrence of surge. This reduction in surge can reduce noise levels in a turbocharger and increase efficiency. While prior art shrouds do have grooves that conform to the shape of their blades, these grooves provide surfaces that face across the stream rather than downstream.

With regard to claim 1, (and disclosed on pg. 4 and FIGS. 1 - 3) the compressor of the present invention includes a compressor wheel having a hub 1 and free-ended compressor blades 5. This wheel is mounted for rotation on a shaft 2. Each blade is characterized by a free-ended outer edge, an upstream leading edge and a downstream trailing edge.

A shroud 4 is mounted around the outer edges of the compressor blades 5. This shroud defines a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud.

In cross-section, the shroud 4 forms a surface along the flow path. This surface is characterized by a profile that includes a relative discontinuity (middle of page 4) in the region of the trailing edge. The discontinuity forms a downstream-facing blocking face adapted to impede an upstream flow of gas between the shroud and the wheel. The

blocking face extends across the gas flow path to form a sharp edge 13 connecting the blocking face to a smoothly curving surface along the gas flow path upstream of the blocking face.

With regard to claim 16, which depends from claim 1, the blocking face forms a second sharp edge (see, e.g., FIG.4D) on an opposite side of the blocking face from the first sharp edge. The second sharp edge connects the blocking face to a second smoothly curving surface that is downstream of the blocking face.

VI) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

GROUND 1:

Whether claims 1, 15/1 and 18 are anticipated under 35 U.S.C. § 102(b) by Mitsubori et al., U.S. Patent No. 5,246,335.

GROUND 2:

Whether claims 1, 4, 5, 6, 9, 11, 12/6, 13/6, 14/6, 15/6, 12/9, 13/9, 14/9, 12/4, 13/4, 14/4, 15/1, 15/4, 15/11 and 18 are unpatentable under 35 U.S.C. § 103(a) over Yoshinaga et al., U.S. Patent No. 4,395,197, in view of Jones, U.S. Patent No. 3,893,787.

GROUND 3:

Whether claims 1, 4, 5, 9, 11, 13/9, 14/9, 13/4, 14/4, 15/1, 15/4, 15/11 and 18 are unpatentable under 35 U.S.C. § 103(a) over Fabri et al., U.S. Patent No. 3,824,029, in view of Jones, U.S. Patent No. 3,893,787.

GROUND 4:

Whether claims 16 and 17 are unpatentable under 35 U.S.C. § 103(a) over Fabri, U.S. Patent No. 3,824,029, in view of Jones, U.S. Patent No. 3,893,787, and further in view of Trumpler, U.S. Patent No. 2,471,174.

GROUND 5:

Whether claims 1, 4, 5, 6, 9, 11, 12/6, 13/6, 14/6, 15/6, 12/9, 13/9, 14/9, 12/4, 13/4, 14/4, 15/1, 15/4, 15/11 and 18 are unpatentable under 35 U.S.C. § 103(a) over Yoshinaga, U.S. Patent No. 4,395,197.

GROUND 6:

Whether claims 1, 4, 5, 9, 11, 13/9, 14/9, 13/4, 14/4, 15/1, 15/4, 15/11 and 18 are unpatentable under 35 U.S.C. § 103(a) over Fabri, U.S. Patent No. 3,824,029.

GROUND 7:

Whether claims 16 and 17 are unpatentable under 35 U.S.C. § 103(a) over Fabri, U.S. Patent No. 3,824,029, in view of Trumpler, U.S. Patent No. 2,471,174.

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VII) ARGUMENT

In the following seven sections (corresponding to the seven grounds of rejection), five arguments (designated as Arguments (a) – (e)) are presented repeatedly in substantially similar form. To simplify the adjudication of this appeal, the appellant is identifying in advance the sections (i.e., the Grounds) in which the Arguments are repeated. These Arguments are also identified by their designations within the text of each section. In particular, the five arguments are presented in the sections as follows:

In Section A) (Ground 1): Argument (a)

In Section B) (Ground 2): Arguments (b), (d) and (e)

In Section C) (Ground 3): Arguments (c), (d) and (e)

In Section D) (Ground 4): Arguments (c), (d) and (e)

In Section E) (Ground 5): Arguments (b), (d) and (e)

In Section F) (Ground 6): Arguments (c), (d) and (e)

In Section G) (Ground 7): Arguments (c), (d) and (e)

In the Arguments, reference will be made to a number of figures. The complete set of these figures are shown in one group immediately below. Each figure identifies the source from which it is taken. The appellant has added annotations to the figures to aid in the discussion of the Arguments.

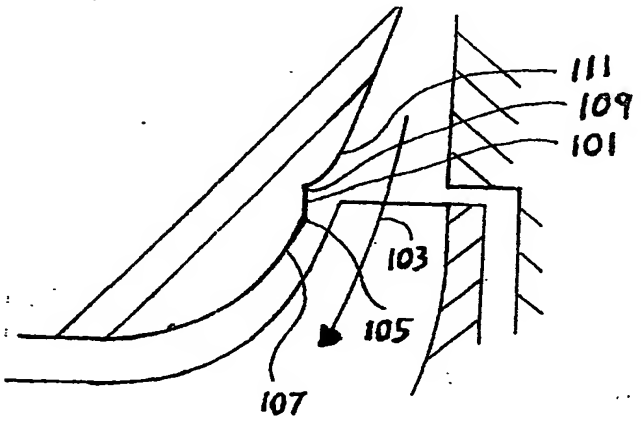

Figure A [from the present application, with annotations added]

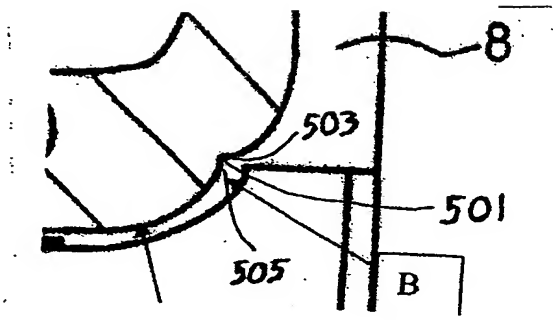

Figure B [from Mitsubori, with annotations added]

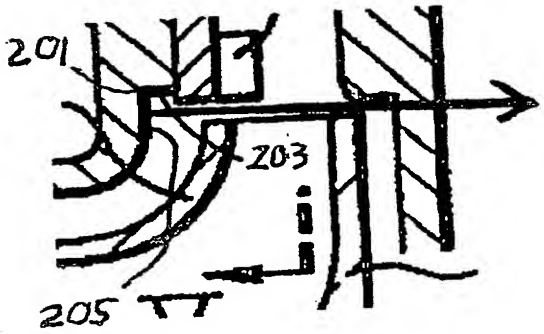

Figure C [from Yoshinaga et al., with annotations added]

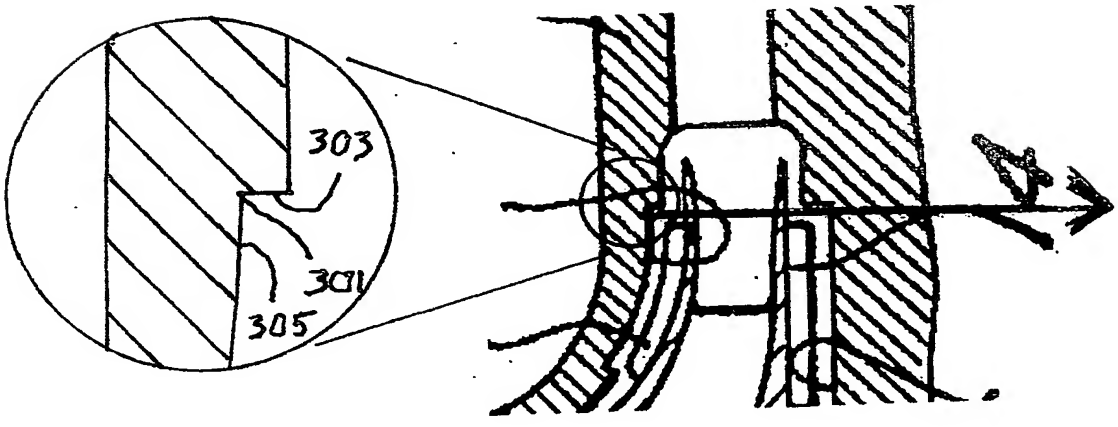

Figure D [from Fabri et al., with annotations added]

A) GROUND 1, CLAIMS 1, 15/1 AND 18 [Argument (a)]

The Examiner has finally rejected 1, 15 and 18 under 35 U.S.C. § 102(b) as allegedly anticipated by Mitsubori, U.S. Patent No. 5,246,335. However, as discussed below, Mitsubori fails to disclose the features of the Appellant's invention recited in finally rejected in claims 1, 15 and 18. Accordingly, the rejection is improper and should be reversed.

Claim 1 recites a downstream-facing blocking face (Figure A, #101) extending across the gas flow path to form a sharp edge (Figure A, #105) connecting the blocking face to a smoothly curving surface (Figure A, #107) along the gas flow path upstream of the blocking face. In other words, the sharp edge is between the downstream-facing blocking face and the smoothly curving surface upstream of the blocking face. For these claim elements to be met, **the sharp edge #105 inherently must be at the upstream side of the downstream-facing blocking face #101**.

The drawing from Mitsubori et al. shown on page 7 of the final Office Action, is replicated in part as Figure B, with additional notations. In the drawing, the depicted discontinuity is made of a dimple having a single sharp edge #501 at the base of the dimple, an upstream-facing face #503 downstream of the sharp edge, and a downstream-facing face #505 upstream of the sharp edge. The sharp edge is on the downstream side of the downstream-facing blocking face. Mitsubori et al. fails to disclose a sharp edge connecting a downstream-facing blocking face to a smoothly curving surface upstream of the blocking face.

In response to this argument, which was previously presented in Appellant's last Amendment, the Examiner (on page 2 of the final Office Action) repeats the assertion that the elements are shown, and recites that the sharp edge in Mitsubori still extends across the gas flow path, since it extends perpendicular to the axis of rotor rotation. The Appellant respectfully traverses that this assertion supports a rejection.

The only sharp edge in Mitsubori is edge #501 (Figure B). That edge is on the downstream side of the only downstream-facing face #503. As noted above, to be within the claim limitations, it is inherent that the sharp edge be at the upstream side of the downstream-facing blocking face. Mitsubori fails to disclose a sharp edge connecting a

blocking face to a smoothly curving surface upstream of the blocking face, as claimed. Therefore, Mitsubori fails to disclose a device having the features of the present claims.

Because the cited reference fails to disclose the features of claim 1, 15/1 and 18, the Office Action fails to assert a prima facie case of anticipation, and the Appellant respectfully requests the rejections of claims 1, 15/1, and 18 under 35 U.S.C. § 102(b) be reversed.

B) GROUND 2, CLAIMS 1, 4, 5, 6, 9, 11, 12/6, 13/6, 14/6, 15/6, 12/9, 13/9, 14/9, 12/4, 13/4, 14/4, 15/1, 15/4, 15/11 AND 18 [Arguments (b), (d) and (e)]

The Examiner has finally rejected claims 1, 4, 5, 6, 9, 11, 12/6, 13/6, 14/6, 15/6, 12/9, 13/9, 14/9, 13/4, 14/4, 15/1, 15/4, 15/11 and 18 as allegedly unpatentable under 35 U.S.C. § 103(a) over Yoshinaga, U.S. Patent No. 4,395,197, in view of Jones, U.S. Patent No. 3,893,787. As discussed below, this rejection is improper and should be reversed.

i) Yoshinaga Fails to Disclose The Asserted Features [Argument (b)]

As previously discussed in Section (A), above, claim 1 recites a downstream-facing blocking face (Figure A, #101) extending across the gas flow path to form a sharp edge (Figure A, #105) connecting the blocking face to a smoothly curving surface (Figure A, #107) along the gas flow path upstream of the blocking face. In other words, the sharp edge is between the downstream-facing blocking face and the smoothly curving surface upstream of the blocking face. For these claim elements to be met, **the sharp edge #105 inherently must be at the upstream side of the downstream-facing blocking face #101**.

On pages 8-9 of the Office Action, the examiner provides written references to indicators added to a Yoshinaga figure, which is shown on page 10 of the Office Action. Those references identify a discontinuity 'B' and a smoothly curving surface 'C' on the Office Action copy of the figure (and replicated in Figure C, above). As is apparent in the figure, this discontinuity connects a smoothly curving surface upstream of the discontinuity to an upstream-facing face, not a downstream-facing face. The Yoshinaga et al. patent clearly fails to disclose a sharp edge that connects a downstream-facing blocking face to a smoothly curving surface upstream of the blocking face.

In response to a similar argument made by the appellant in the last Amendment, the Examiner (on the bottom of page 2 of the final Office Action) recites that a downstream-facing blocking face is formed by the discontinuity. The appellant responds that in Figure C, above, it is apparent that the discontinuity forms a sharp edge #201 that connects an upstream-facing face #203 to a smoothly curving surface #205 upstream of the continuity.

Because the cited reference fails to disclose a discontinuity that forms a sharp edge that is between a downstream-facing blocking face and a smoothly curving surface upstream of the blocking face, the Office Action fails to assert a prima facie case of obviousness, and the appellant respectfully requests the rejections of all claims rejected under Ground 2 be reversed.

ii) Yoshinaga et al. Fails To Disclose a Blocking Face That is In The Recited Gas Flow Path [Argument (d)]

Claim 1 recites a shroud mounted around the outer edges of the compressor blades and defining a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. Claim 1 further recites a shroud that forms a surface along the flow path, the surface being characterized by a profile that includes a relative discontinuity in the region of the trailing edge, and further recites that the discontinuity forms a downstream-facing blocking face adapted to impede an upstream flow of gas between the shroud and the wheel, the blocking face extending across the gas flow path.

In asserting that these features are disclosed in the prior art, the Office Action alleged to identify a blocking face in the Yoshinaga et al. patent. The identified face was on a housing wall outside the shroud of a shrouded turbine wheel. In supporting this position, the Office Action (at the top of page 4) recites that the asserted discontinuities are clearly located along the gas flow path through which the compressor blades are rotating to pressurize the air. This assertion completely discounts or ignores the meaning of the word shroud, which is a clear and precise term of art to a person skilled in the art of designing turbocharger turbines. Moreover, it attempts to call two wholly separate regions of space a single gas flow path, even though one of them does not meet the recited limitations.

Shrouds Are Well Known In The Art

A person skilled in the art of designing turbocharger turbines is both well educated and knowledgeable in the standard parts of a turbine. One fundamental such part is a portion of the housing known as a shroud. This part may be machined from the housing, or it may be an insert to the outer shell of the housing.

A person skilled in the art recognizes that a turbine shroud is the wall that forces the air to pass through and between the blades so that the air pressure and momentum can force the blades to spin the turbine wheel in rotation. It is fundamental that a shroud is required for a turbine to function. Without a shroud, the air would rapidly escape from between the blades and the turbine would not function with any practical value. It is well known that there are two kinds of wheels, one with a shroud incorporated in the wheel, and one that works with a shroud in an outer wall. When the shroud is incorporated in the wheel, the surrounding housing is not a shroud. The appellant notes that Yoshinaga et al. explicitly identifies a shroud 24 conforming to the meaning well understood by persons skilled in the art.

The Yoshinaga et al. patent fails to disclose a discontinuity along and extending across a flow path defined by a shroud.

The Alleged Discontinuity Is Not In the Claimed Flow Path

While an examiner is directed to use the broadest interpretation of the claim language, the interpretation must be a reasonable interpretation. Claim 1 defines a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. The Office Action appears to allege that "the gas flow path" includes both the path passing within the shroud and an entirely separate path extending through small gaps at either end of the shroud and passing outside the shroud between the shroud and the housing wall. That second pathway is not within the shroud, and no blades rotate through that pathway. A person skilled in the art would not reasonably consider the housing wall to be a shroud, or a pathway of gas leaking around the ends of a rotating shroud to be part of a gas flow path between the shroud and the hub.

Because the asserted discontinuity is not located along the claimed gas flow path between the shroud and the wheel, the Yoshinaga et al. patent fails to disclose the claimed discontinuity, and the Office Action therefore fails to assert a prima facie case of obviousness. The appellant respectfully requests the rejections of all claims of Ground 2, under 35 U.S.C. § 103(a), be withdrawn.

iii) Yoshinaga et al. Fails To Disclose a Downstream-Facing Face [Argument (e)]

The Office Action recites that Yoshinaga et al. discloses a downstream facing face, and notes that during examination claims must be interpreted as broadly as their terms reasonably allow. Portions of the figure identified in the Office Action are reproduced in Figure C, above, with a line added showing the direction of the wall in the vicinity of the trailing edges. This wall clearly faces directly across the flow. There is no portion of the passageway that is angled to suggest that the wall is in a downstream-facing direction. Thus the appellant respectfully notes that there is no reasonable interpretation of the term downstream-facing face that applies to these figures.

In response, the Examiner has argued (on page 4 of the Office Action) that the discontinuities are located towards the outlet side of the compressor, and are broadly considered to be in the downstream-facing direction. The appellant respectfully notes that the phrase "downstream-facing" would lack any reasonable meaning if it were interpreted as indicating a direction directly across the flow, and that a person of skill in the art would not reasonably believe that such a direction is downstream-facing.

Because the cited references fail to disclose a downstream-facing blocking face, the appellant respectfully requests the rejections of claims under Ground 2 be withdrawn.

C) GROUND 3, CLAIMS 1, 4, 5, 9, 11, 13/9, 14/9, 13/4, 14/4, 15/1, 15/4, 15/11 AND 18

The Examiner has finally rejected claims 1, 4, 5, 9, 11, 13/9, 14/9, 13/4, 14/4, 15/1, 15/4, 15/11 and 18 as allegedly unpatentable under 35 U.S.C. § 103(a) over Fabri, U.S.

Patent No. 3,824,029, in view of Jones, U.S. Patent No. 3,893,787. As discussed below, this rejection is improper and should be reversed.

i) Fabri et al. Fails to Disclose The Asserted Features [Argument (c)]

As previously discussed in Section (A), above, claim 1 recites a downstream-facing blocking face (Figure A, #101) extending across the gas flow path to form a sharp edge (Figure A, #105) connecting the blocking face to a smoothly curving surface (Figure A, #107) along the gas flow path upstream of the blocking face. In other words, the sharp edge is between the downstream-facing blocking face and the smoothly curving surface upstream of the blocking face. For these claim elements to be met, **the sharp edge #105 inherently must be at the upstream side of the downstream-facing blocking face #101**.

On pages 11-12 of the Office Action, the examiner provides written references to indicators added to a Fabri figure, which is shown on page 13 of the Office Action. Those references identify a discontinuity 'B' and a smoothly curving surface 'C' on the Office Action copy of the figure (and replicated in Figure D, above). As is apparent in the figure, this discontinuity connects a smoothly curving surface upstream of the sharp edge to an upstream-facing face, not a downstream-facing face. The Fabri et al. patent clearly fails to disclose a sharp edge that connects a downstream-facing blocking face to a smoothly curving surface upstream of the blocking face.

In response to a similar argument made by the appellant in the last Amendment, the Examiner (on page 3 of the final Office Action) recites that a downstream-facing blocking face is formed by the discontinuity. The appellant responds that in Figure D, above, it is apparent that the discontinuity forms a sharp edge #301 that connects an upstream-facing face #303 to a smoothly curving surface #305 upstream of the continuity.

Because the cited reference fails to disclose a discontinuity that forms a sharp edge that is between a downstream-facing blocking face and a smoothly curving surface upstream of the blocking face, the Office Action fails to assert a prima facie case of obviousness, and the appellant respectfully requests the rejections of all claims rejected under Ground 3 be reversed.

ii) Fabri et al. Fails To Disclose a Blocking Face That is In The Recited Gas Flow Path [Argument (d)]

Claim 1 recites a shroud mounted around the outer edges of the compressor blades and defining a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. Claim 1 further recites a shroud that forms a surface along the flow path, the surface being characterized by a profile that includes a relative discontinuity in the region of the trailing edge, and further recites that the discontinuity forms a downstream-facing blocking face adapted to impede an upstream flow of gas between the shroud and the wheel, the blocking face extending across the gas flow path.

In asserting that these features are disclosed in the prior art, the Office Action identified an alleged blocking face in the Fabri et al. patent. The identified face was on a housing wall outside the shroud of a shrouded turbine wheel. In supporting this position, the Office Action (at the top of page 4) recites that the asserted discontinuities are clearly located along the gas flow path through which the compressor blades are rotating to pressurize the air. This assertion completely discounts or ignores the meaning of the word shroud, which is a clear and precise term of art to a person skilled in the art of designing turbocharger turbines. Moreover, it attempts to call two wholly separate regions of space a single gas flow path, even though one of them does not meet the recited limitations.

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A person skilled in the art of designing turbocharger turbines is both well educated and knowledgeable in the standard parts of a turbine. One fundamental such part is a portion of the housing known as a shroud. This part may be machined from the housing, or it may be an insert to the outer shell of the housing.

A person skilled in the art recognizes that a turbine shroud is the wall that forces the air to pass through and between the blades so that the air pressure and momentum can force the blades to spin the turbine wheel in rotation. It is fundamental that a shroud is required for a turbine to function. Without a shroud, the air would rapidly escape from between the blades and the turbine would not function with any practical value. It is well known that there are two kinds of wheels, one with a shroud incorporated in the wheel,

and one that works with a shroud in an outer wall. When the shroud is incorporated in the wheel, the surrounding housing is not a shroud. The appellant notes that Fabri et al. explicitly identifies a shroud 24 conforming to the meaning well understood by persons skilled in the art.

The Fabri et al. patent fails to disclose a discontinuity along and extending across a flow path defined by a shroud.

The Alleged Discontinuity Is Not In the Claimed Flow Path

While an examiner is directed to use the broadest interpretation of the claim language, the interpretation must be a reasonable interpretation. Claim 1 defines a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. The Office Action appears to allege that "the gas flow path" includes both the path passing within the shroud and an entirely separate path extending through small gaps at either end of the shroud and passing outside the shroud between the shroud and the housing wall. That second pathway is not within the shroud, and no blades rotate through that pathway. A person skilled in the art would not reasonably consider the housing wall to be a shroud, or a pathway of gas leaking around the ends of a rotating shroud to be part of a gas flow path between the shroud and the hub.

Because the asserted discontinuity is not located along the claimed gas flow path between the shroud and the wheel, the Fabri et al. patent fails to disclose the claimed discontinuity, and the Office Action therefore fails to assert a prima facie case of obviousness. The appellant respectfully requests the rejections of all claims of Ground 3, under 35 U.S.C. § 103(a), be withdrawn.

iii) Fabri et al. Fails To Disclose a Downstream-Facing Face [Argument (e)]

The Office Action recites that Fabri et al. discloses a downstream facing face, and notes that during examination claims must be interpreted as broadly as their terms reasonably allow. Portions of the figures identified in the Office Action are reproduced in Figure D, with a line 311 added showing the direction of the wall in the vicinity of the

trailing edge. This wall can be seen to be facing directly across the flow. There is no portion of the passageway that is angled to suggest that the wall is in a downstream-facing direction. Thus the appellant respectfully notes that there is no reasonable interpretation of the term downstream-facing face that applies to this figure.

In response, the Examiner has argued (on page 4 of the Office Action) that the discontinuities are located towards the outlet side of the compressor, and are broadly considered to be in the downstream-facing direction. The appellant respectfully notes that the phrase "downstream-facing" would lack any reasonable meaning if it were interpreted as indicating a direction directly across the flow, and that a person of skill in the art would not reasonably believe that such a direction is downstream-facing.

Because the cited references fail to disclose a downstream-facing blocking face, the appellant respectfully requests the rejections of claims under Ground 3 be withdrawn.

D) GROUND 4, CLAIMS 16 AND 17

The Examiner has finally rejected claims 16 and 17 as allegedly unpatentable under 35 U.S.C. § 103(a) over Fabri, U.S. Patent No. 3,824,029, in view of Jones, U.S. Patent No. 3,893,787, as applied to claims 1 and 4, and further in view of Trumpler, U.S. Patent No. 2,471,174. Claims 16 and 17 depend (directly or indirectly) from claim 1. As discussed below, this rejection is improper and should be reversed. Please note that these arguments are the same as those made in section (C), above, with respect to claim 1.

i) Fabri et al. Fails to Disclose The Asserted Features [Argument (c)]

As previously discussed in Section (A), above, claim 1 recites a downstream-facing blocking face (Figure A, #101) extending across the gas flow path to form a sharp edge (Figure A, #105) connecting the blocking face to a smoothly curving surface (Figure A, #107) along the gas flow path upstream of the blocking face. In other words, the sharp edge is between the downstream-facing blocking face and the smoothly curving surface upstream of the blocking face. For these claim elements to be met, **the sharp edge #105 inherently must be at the upstream side of the downstream-facing blocking face #101**.

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Because the cited reference fails to disclose a discontinuity that forms a sharp edge that is between a downstream-facing blocking face and a smoothly curving surface upstream of the blocking face, the Office Action fails to assert a prima facie case of obviousness, and the appellant respectfully requests the rejections of all claims rejected under Ground 4 be reversed.

ii) Fabri et al. Fails To Disclose a Blocking Face That is In The Recited Gas Flow Path [Argument (d)]

Claim 1 recites a shroud mounted around the outer edges of the compressor blades and defining a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. Claim 1 further recites a shroud that forms a surface along the flow path, the surface being characterized by a profile that includes a relative discontinuity in the region of the trailing edge, and further recites that the discontinuity forms a downstream-facing blocking face adapted to impede an upstream flow of gas between the shroud and the wheel, the blocking face extending across the gas flow path.

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The Fabri et al. patent fails to disclose a discontinuity along and extending across a flow path defined by a shroud.

The Alleged Discontinuity Is Not In the Claimed Flow Path

While an examiner is directed to use the broadest interpretation of the claim language, the interpretation must be a reasonable interpretation. Claim 1 defines a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. The Office Action appears to

allege that "the gas flow path" includes both the path passing within the shroud and an entirely separate path extending through small gaps at either end of the shroud and passing outside the shroud between the shroud and the housing wall. That second pathway is not within the shroud, and no blades rotate through that pathway. A person skilled in the art would not reasonably consider the housing wall to be a shroud, or a pathway of gas leaking around the ends of a rotating shroud to be part of a gas flow path between the shroud and the hub.

Because the asserted discontinuity is not located along the claimed gas flow path between the shroud and the wheel, the Fabri et al. patent fails to disclose the claimed discontinuity, and the Office Action therefore fails to assert a prima facie case of obviousness. The appellant respectfully requests the rejections of all claims of Ground 4, under 35 U.S.C. § 103(a), be withdrawn.

iii) Fabri et al. Fails To Disclose a Downstream-Facing Face [Argument (e)]

The Office Action recites that Fabri et al. discloses a downstream facing face, and notes that during examination claims must be interpreted as broadly as their terms reasonably allow. Portions of the figures identified in the Office Action are reproduced in Figure D, with a line 311 added showing the direction of the wall in the vicinity of the trailing edge. This wall can be seen to be facing directly across the flow. There is no portion of the passageway that is angled to suggest that the wall is in a downstream-facing direction. Thus the appellant respectfully notes that there is no reasonable interpretation of the term downstream-facing face that applies to this figure.

In response, the Examiner has argued (on page 4 of the Office Action) that the discontinuities are located towards the outlet side of the compressor, and are broadly considered to be in the downstream-facing direction. The appellant respectfully notes that the phrase "downstream-facing" would lack any reasonable meaning if it were interpreted as indicating a direction directly across the flow, and that a person of skill in the art would not reasonably believe that such a direction is downstream-facing.

Because the cited references fail to disclose a downstream-facing blocking face, the appellant respectfully requests the rejections of claims under Ground 4 be withdrawn.

E) GROUND 5, CLAIMS 1, 4, 5, 6, 9, 11, 12/6, 13/6, 14/6, 15/6, 12/9, 13/9, 14/9, 12/4, 13/4, 14/4, 15/1, 15/4, 15/11 AND 18

The Examiner has finally rejected claims 1, 4, 5, 6, 9, 11, 12/6, 13/6, 14/6, 15/6, 12/9, 13/9, 14/9, 12/4, 13/4, 14/4, 15/1, 15/4, 15/11 and 18 as allegedly unpatentable under 35 U.S.C. § 103(a) over Yoshinaga, U.S. Patent No. 4,395,197. As discussed below, this rejection is improper and should be reversed.

i) Yoshinaga Fails to Disclose The Asserted Features [Argument (b)]

As previously discussed in Section (A), above, claim 1 recites a downstream-facing blocking face (Figure A, #101) extending across the gas flow path to form a sharp edge (Figure A, #105) connecting the blocking face to a smoothly curving surface (Figure A, #107) along the gas flow path upstream of the blocking face. In other words, the sharp edge is between the downstream-facing blocking face and the smoothly curving surface upstream of the blocking face. For these claim elements to be met, **the sharp edge #105 inherently must be at the upstream side of the downstream-facing blocking face #101**.

On pages 8-9 of the Office Action, the examiner provides written references to indicators added to a Yoshinaga figure, which is shown on page 10 of the Office Action. Those references identify a discontinuity 'B' and a smoothly curving surface 'C' on the Office Action copy of the figure (and replicated in Figure C, above). As is apparent in the figure, this discontinuity connects a smoothly curving surface upstream of the discontinuity to an upstream-facing face, not a downstream-facing face. The Yoshinaga et al. patent clearly fails to disclose a sharp edge that connects a downstream-facing blocking face to a smoothly curving surface upstream of the blocking face.

In response to a similar argument made by the appellant in the last Amendment, the Examiner (on the bottom of page 2 of the final Office Action) recites that a downstream-facing blocking face is formed by the discontinuity. The appellant responds that in Figure C, above, it is apparent that the discontinuity forms a sharp edge #201 that connects an upstream-facing face #203 to a smoothly curving surface #205 upstream of the continuity.

Because the cited reference fails to disclose a discontinuity that forms a sharp edge that is between a downstream-facing blocking face and a smoothly curving surface upstream of the blocking face, the Office Action fails to assert a prima facie case of obviousness, and the appellant respectfully requests the rejections of all claims rejected under Ground 5 be reversed.

ii) Yoshinaga et al. Fails To Disclose a Blocking Face That is In The Recited Gas Flow Path [Argument (d)]

Claim 1 recites a shroud mounted around the outer edges of the compressor blades and defining a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. Claim 1 further recites a shroud that forms a surface along the flow path, the surface being characterized by a profile that includes a relative discontinuity in the region of the trailing edge, and further recites that the discontinuity forms a downstream-facing blocking face adapted to impede an upstream flow of gas between the shroud and the wheel, the blocking face extending across the gas flow path.

In asserting that these features are disclosed in the prior art, the Office Action alleged to identify a blocking face in the Yoshinaga et al. patent. The identified face was on a housing wall outside the shroud of a shrouded turbine wheel. In supporting this position, the Office Action (at the top of page 4) recites that the asserted discontinuities are clearly located along the gas flow path through which the compressor blades are rotating to pressurize the air. This assertion completely discounts or ignores the meaning of the word shroud, which is a clear and precise term of art to a person skilled in the art of designing turbocharger turbines. Moreover, it attempts to call two wholly separate regions of space a single gas flow path, even though one of them does not meet the recited limitations.

Shrouds Are Well Known In The Art

A person skilled in the art of designing turbocharger turbines is both well educated and knowledgeable in the standard parts of a turbine. One fundamental such part is a portion of the housing known as a shroud. This part may be machined from the housing, or it may be an insert to the outer shell of the housing.

A person skilled in the art recognizes that a turbine shroud is the wall that forces the air to pass through and between the blades so that the air pressure and momentum can force the blades to spin the turbine wheel in rotation. It is fundamental that a shroud is required for a turbine to function. Without a shroud, the air would rapidly escape from between the blades and the turbine would not function with any practical value. It is well known that there are two kinds of wheels, one with a shroud incorporated in the wheel, and one that works with a shroud in an outer wall. When the shroud is incorporated in the wheel, the surrounding housing is not a shroud. The appellant notes that Yoshinaga et al. explicitly identifies a shroud 24 conforming to the meaning well understood by persons skilled in the art.

The Yoshinaga et al. patent fails to disclose a discontinuity along and extending across a flow path defined by a shroud.

The Alleged Discontinuity Is Not In the Claimed Flow Path

While an examiner is directed to use the broadest interpretation of the claim language, the interpretation must be a reasonable interpretation. Claim 1 defines a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. The Office Action appears to allege that "the gas flow path" includes both the path passing within the shroud and an entirely separate path extending through small gaps at either end of the shroud and passing outside the shroud between the shroud and the housing wall. That second pathway is not within the shroud, and no blades rotate through that pathway. A person skilled in the art would not reasonably consider the housing wall to be a shroud, or a pathway of gas leaking around the ends of a rotating shroud to be part of a gas flow path between the shroud and the hub.

Because the asserted discontinuity is not located along the claimed gas flow path between the shroud and the wheel, the Yoshinaga et al. patent fails to disclose the claimed discontinuity, and the Office Action therefore fails to assert a prima facie case of obviousness. The appellant respectfully requests the rejections of all claims of Ground 5, under 35 U.S.C. § 103(a), be withdrawn.

iii) Yoshinaga et al. Fails To Disclose a Downstream-Facing Face [Argument (e)]

The Office Action recites that Yoshinaga et al. discloses a downstream facing face, and notes that during examination claims must be interpreted as broadly as their terms reasonably allow. Portions of the figure identified in the Office Action are reproduced in Figure C, above, with a line added showing the direction of the wall in the vicinity of the trailing edges. This wall clearly faces directly across the flow. There is no portion of the passageway that is angled to suggest that the wall is in a downstream-facing direction. Thus the appellant respectfully notes that there is no reasonable interpretation of the term downstream-facing face that applies to these figures.

In response, the Examiner has argued (on page 4 of the Office Action) that the discontinuities are located towards the outlet side of the compressor, and are broadly considered to be in the downstream-facing direction. The appellant respectfully notes that the phrase "downstream-facing" would lack any reasonable meaning if it were interpreted as indicating a direction directly across the flow, and that a person of skill in the art would not reasonably believe that such a direction is downstream-facing.

Because the cited references fail to disclose a downstream-facing blocking face, the appellant respectfully requests the rejections of claims under Ground 5 be withdrawn.

F) GROUND 6, CLAIMS 1, 4, 5, 9, 11, 13/9, 14/9, 13/4, 14/4, 15/1, 15/4, 15/11 AND 18

The Examiner has finally rejected claims 1, 4, 5, 9, 11, 13/9, 14/9, 13/4, 14/4, 15/1, 15/4, 15/11 and 18 as allegedly unpatentable under 35 U.S.C. § 103(a) over Fabri, U.S. Patent No. 3,824,029. As discussed below, this rejection is improper and should be reversed.

i) Fabri et al. Fails to Disclose The Asserted Features [Argument (c)]

As previously discussed in Section (A), above, claim 1 recites a downstream-facing blocking face (Figure A, #101) extending across the gas flow path to form a sharp edge (Figure A, #105) connecting the blocking face to a smoothly curving surface (Figure

A, #107) along the gas flow path upstream of the blocking face. In other words, the sharp edge is between the downstream-facing blocking face and the smoothly curving surface upstream of the blocking face. For these claim elements to be met, **the sharp edge #105 inherently must be at the upstream side of the downstream-facing blocking face #101**.

On pages 11-12 of the Office Action, the examiner provides written references to indicators added to a Fabri figure, which is shown on page 13 of the Office Action. Those references identify a discontinuity 'B' and a smoothly curving surface 'C' on the Office Action copy of the figure (and replicated in Figure D, above). As is apparent in the figure, this discontinuity connects a smoothly curving surface upstream of the sharp edge to an upstream-facing face, not a downstream-facing face. The Fabri et al. patent clearly fails to disclose a sharp edge that connects a downstream-facing blocking face to a smoothly curving surface upstream of the blocking face.

In response to a similar argument made by the appellant in the last Amendment, the Examiner (on page 3 of the final Office Action) recites that a downstream-facing blocking face is formed by the discontinuity. The appellant responds that in Figure D, above, it is apparent that the discontinuity forms a sharp edge #301 that connects an upstream-facing face #303 to a smoothly curving surface #305 upstream of the continuity.

Because the cited reference fails to disclose a discontinuity that forms a sharp edge that is between a downstream-facing blocking face and a smoothly curving surface upstream of the blocking face, the Office Action fails to assert a prima facie case of obviousness, and the appellant respectfully requests the rejections of all claims rejected under Ground 6 be reversed.

ii) Fabri et al. Fails To Disclose a Blocking Face That is In The Recited Gas Flow Path [Argument (d)]

Claim 1 recites a shroud mounted around the outer edges of the compressor blades and defining a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. Claim 1 further recites a shroud that forms a surface along the flow path, the surface being characterized by a profile that includes a relative discontinuity in the region of the trailing edge, and further recites that the discontinuity forms a downstream-facing blocking face adapted to

impede an upstream flow of gas between the shroud and the wheel, the blocking face extending across the gas flow path.

In asserting that these features are disclosed in the prior art, the Office Action identified an alleged blocking face in the Fabri et al. patent. The identified face was on a housing wall outside the shroud of a shrouded turbine wheel. In supporting this position, the Office Action (at the top of page 4) recites that the asserted discontinuities are clearly located along the gas flow path through which the compressor blades are rotating to pressurize the air. This assertion completely discounts or ignores the meaning of the word shroud, which is a clear and precise term of art to a person skilled in the art of designing turbocharger turbines. Moreover, it attempts to call two wholly separate regions of space a single gas flow path, even though one of them does not meet the recited limitations.

Shrouds Are Well Known In The Art

A person skilled in the art of designing turbocharger turbines is both well educated and knowledgeable in the standard parts of a turbine. One fundamental such part is a portion of the housing known as a shroud. This part may be machined from the housing, or it may be an insert to the outer shell of the housing.

A person skilled in the art recognizes that a turbine shroud is the wall that forces the air to pass through and between the blades so that the air pressure and momentum can force the blades to spin the turbine wheel in rotation. It is fundamental that a shroud is required for a turbine to function. Without a shroud, the air would rapidly escape from between the blades and the turbine would not function with any practical value. It is well known that there are two kinds of wheels, one with a shroud incorporated in the wheel, and one that works with a shroud in an outer wall. When the shroud is incorporated in the wheel, the surrounding housing is not a shroud. The appellant notes that Fabri et al. explicitly identifies a shroud 24 conforming to the meaning well understood by persons skilled in the art.

The Fabri et al. patent fails to disclose a discontinuity along and extending across a flow path defined by a shroud.

The Alleged Discontinuity Is Not In the Claimed Flow Path

While an examiner is directed to use the broadest interpretation of the claim language, the interpretation must be a reasonable interpretation. Claim 1 defines a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. The Office Action appears to allege that "the gas flow path" includes both the path passing within the shroud and an entirely separate path extending through small gaps at either end of the shroud and passing outside the shroud between the shroud and the housing wall. That second pathway is not within the shroud, and no blades rotate through that pathway. A person skilled in the art would not reasonably consider the housing wall to be a shroud, or a pathway of gas leaking around the ends of a rotating shroud to be part of a gas flow path between the shroud and the hub.

Because the asserted discontinuity is not located along the claimed gas flow path between the shroud and the wheel, the Fabri et al. patent fails to disclose the claimed discontinuity, and the Office Action therefore fails to assert a prima facie case of obviousness. The appellant respectfully requests the rejections of all claims of Ground 6, under 35 U.S.C. § 103(a), be withdrawn.

iii) Fabri et al. Fails To Disclose a Downstream-Facing Face [Argument (e)]

The Office Action recites that Fabri et al. discloses a downstream facing face, and notes that during examination claims must be interpreted as broadly as their terms reasonably allow. Portions of the figures identified in the Office Action are reproduced in Figure D, with a line 311 added showing the direction of the wall in the vicinity of the trailing edge. This wall can be seen to be facing directly across the flow. There is no portion of the passageway that is angled to suggest that the wall is in a downstream-facing direction. Thus the appellant respectfully notes that there is no reasonable interpretation of the term downstream-facing face that applies to this figure.

In response, the Examiner has argued (on page 4 of the Office Action) that the discontinuities are located towards the outlet side of the compressor, and are broadly considered to be in the downstream-facing direction. The appellant respectfully notes that the phrase "downstream-facing" would lack any reasonable meaning if it were interpreted

as indicating a direction directly across the flow, and that a person of skill in the art would not reasonably believe that such a direction is downstream-facing.

Because the cited references fail to disclose a downstream-facing blocking face, the appellant respectfully requests the rejections of claims under Ground 6 be withdrawn.

G) GROUND 7, CLAIMS 16 AND 17

The Examiner has finally rejected claims 16 and 17 as allegedly unpatentable under 35 U.S.C. § 103(a) over Fabri, U.S. Patent No. 3,824,029, as applied to claims 1 and 4, in view of Trumpler, U.S. Patent No. 2,471,174. Claims 16 and 17 depend (directly or indirectly) from claim 1. As discussed below, this rejection is improper and should be reversed. Please note that these arguments are the same as those made in section (F), above, with respect to claim 1.

i) Fabri et al. Fails to Disclose The Asserted Features [Argument (c)]

As previously discussed in Section (A), above, claim 1 recites a downstream-facing blocking face (Figure A, #101) extending across the gas flow path to form a sharp edge (Figure A, #105) connecting the blocking face to a smoothly curving surface (Figure A, #107) along the gas flow path upstream of the blocking face. In other words, the sharp edge is between the downstream-facing blocking face and the smoothly curving surface upstream of the blocking face. For these claim elements to be met, **the sharp edge #105 inherently must be at the upstream side of the downstream-facing blocking face #101**.

On pages 11-12 of the Office Action, the examiner provides written references to indicators added to a Fabri figure, which is shown on page 13 of the Office Action. Those references identify a discontinuity 'B' and a smoothly curving surface 'C' on the Office Action copy of the figure (and replicated in Figure D, above). As is apparent in the figure, this discontinuity connects a smoothly curving surface upstream of the sharp edge to an upstream-facing face, not a downstream-facing face. The Fabri et al. patent clearly fails to disclose a sharp edge that connects a downstream-facing blocking face to a smoothly curving surface upstream of the blocking face.

In response to a similar argument made by the appellant in the last Amendment, the Examiner (on page 3 of the final Office Action) recites that a downstream-facing blocking face is formed by the discontinuity. The appellant responds that in Figure D, above, it is apparent that the discontinuity forms a sharp edge #301 that connects an upstream-facing face #303 to a smoothly curving surface #305 upstream of the continuity.

Because the cited reference fails to disclose a discontinuity that forms a sharp edge that is between a downstream-facing blocking face and a smoothly curving surface upstream of the blocking face, the Office Action fails to assert a prima facie case of obviousness, and the appellant respectfully requests the rejections of all claims rejected under Ground 7 be reversed.

ii) Fabri et al. Fails To Disclose a Blocking Face That is In The Recited Gas Flow Path [Argument (d)]

Claim 1 recites a shroud mounted around the outer edges of the compressor blades and defining a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. Claim 1 further recites a shroud that forms a surface along the flow path, the surface being characterized by a profile that includes a relative discontinuity in the region of the trailing edge, and further recites that the discontinuity forms a downstream-facing blocking face adapted to impede an upstream flow of gas between the shroud and the wheel, the blocking face extending across the gas flow path.

In asserting that these features are disclosed in the prior art, the Office Action identified an alleged blocking face in the Fabri et al. patent. The identified face was on a housing wall outside the shroud of a shrouded turbine wheel. In supporting this position, the Office Action (at the top of page 4) recites that the asserted discontinuities are clearly located along the gas flow path through which the compressor blades are rotating to pressurize the air. This assertion completely discounts or ignores the meaning of the word shroud, which is a clear and precise term of art to a person skilled in the art of designing turbocharger turbines. Moreover, it attempts to call two wholly separate regions of space a single gas flow path, even though one of them does not meet the recited limitations.

Shrouds Are Well Known In The Art

A person skilled in the art of designing turbocharger turbines is both well educated and knowledgeable in the standard parts of a turbine. One fundamental such part is a portion of the housing known as a shroud. This part may be machined from the housing, or it may be an insert to the outer shell of the housing.

A person skilled in the art recognizes that a turbine shroud is the wall that forces the air to pass through and between the blades so that the air pressure and momentum can force the blades to spin the turbine wheel in rotation. It is fundamental that a shroud is required for a turbine to function. Without a shroud, the air would rapidly escape from between the blades and the turbine would not function with any practical value. It is well known that there are two kinds of wheels, one with a shroud incorporated in the wheel, and one that works with a shroud in an outer wall. When the shroud is incorporated in the wheel, the surrounding housing is not a shroud. The appellant notes that Fabri et al. explicitly identifies a shroud 24 conforming to the meaning well understood by persons skilled in the art.

The Fabri et al. patent fails to disclose a discontinuity along and extending across a flow path defined by a shroud.

The Alleged Discontinuity Is Not In the Claimed Flow Path

While an examiner is directed to use the broadest interpretation of the claim language, the interpretation must be a reasonable interpretation. Claim 1 defines a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud. The Office Action appears to allege that "the gas flow path" includes both the path passing within the shroud and an entirely separate path extending through small gaps at either end of the shroud and passing outside the shroud between the shroud and the housing wall. That second pathway is not within the shroud, and no blades rotate through that pathway. A person skilled in the art would not reasonably consider the housing wall to be a shroud, or a pathway of gas leaking around the ends of a rotating shroud to be part of a gas flow path between the shroud and the hub.

Because the asserted discontinuity is not located along the claimed gas flow path between the shroud and the wheel, the Fabri et al. patent fails to disclose the claimed discontinuity, and the Office Action therefore fails to assert a prima facie case of obviousness. The appellant respectfully requests the rejections of all claims of Ground 7, under 35 U.S.C. § 103(a), be withdrawn.

iii) Fabri et al. Fails To Disclose a Downstream-Facing Face [Argument (e)]

The Office Action recites that Fabri et al. discloses a downstream facing face, and notes that during examination claims must be interpreted as broadly as their terms reasonably allow. Portions of the figures identified in the Office Action are reproduced in Figure D, with a line 311 added showing the direction of the wall in the vicinity of the trailing edge. This wall can be seen to be facing directly across the flow. There is no portion of the passageway that is angled to suggest that the wall is in a downstream-facing direction. Thus the appellant respectfully notes that there is no reasonable interpretation of the term downstream-facing face that applies to this figure.

In response, the Examiner has argued (on page 4 of the Office Action) that the discontinuities are located towards the outlet side of the compressor, and are broadly considered to be in the downstream-facing direction. The appellant respectfully notes that the phrase "downstream-facing" would lack any reasonable meaning if it were interpreted as indicating a direction directly across the flow, and that a person of skill in the art would not reasonably believe that such a direction is downstream-facing.

Because the cited references fail to disclose a downstream-facing blocking face, the appellant respectfully requests the rejections of claims under Ground 7 be withdrawn.

H) CONCLUSION

For the reasons set forth above, the rejections of claims are improper and should be reversed. A decision directing the Examiner to issue a Notice of Allowance is respectfully requested.

Respectfully submitted,

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VIII) CLAIMS APPENDIX

1. A compressor comprising:

a compressor wheel having a hub, free-ended compressor blades and being mounted for rotation on a shaft, each blade being characterized by a free-ended outer edge, an upstream leading edge and a downstream trailing edge; and

a shroud mounted around the outer edges of the compressor blades and defining a gas flow path between the shroud and the hub from a compressor inlet to a diffuser outlet, through which the blades rotate with respect to the shroud;

wherein in cross-section the shroud forms a surface along the flow path, the surface being characterized by a profile that includes a relative discontinuity in the region of the trailing edge; and

wherein the discontinuity forms a downstream-facing blocking face adapted to impede an upstream flow of gas between the shroud and the wheel, the blocking face extending across the gas flow path to form a sharp edge connecting the blocking face to a smoothly curving surface along the gas flow path upstream of the blocking face.

4. A compressor according to claim 1, wherein the cross-section profile of the shroud surface along the flow path is further characterized by a second relative discontinuity that is in the region of the leading edge, and wherein the second relative discontinuity forms a second-discontinuity downstream-facing blocking face adapted to impede an upstream flow of gas between the shroud and the wheel, the second-discontinuity blocking face extending across the flow path to form a second–discontinuity sharp edge connecting the second blocking face to a second–discontinuity smooth surface upstream of the second-discontinuity blocking face.

5. A compressor according to claim 4 wherein the second discontinuity is located upstream of the leading edge of the wheel blades.

6. A compressor according to claim 5 wherein the second discontinuity is spaced from the leading edge of the wheel blades by a distance of the same order as the axial clearance of the trailing edge from the compressor housing.

9. A compressor according to claim 4, wherein each downstream-facing blocking face comprises a planar surface cut into the curving surface.

11. A compressor according to claim 4, wherein the second–discontinuity downstream-facing blocking face comprises a planar surface cut into the curving surface, and wherein the planar surface is perpendicular to the axis of the shaft.

12. A compressor according to any one of claims 4, 6, or 9, wherein the radial extent of the second discontinuity is of the same order as the radial clearance between the trailing edge and the housing.

13. A compressor according to any one of claims 4, 6, or 9, wherein the sizes of the first and second discontinuities are closely similar.

14. A compressor according to any one of claims 4, 6 or 9, wherein the shapes of the first and second discontinuities are closely similar.

15. A turbocharger comprising a compressor according to any one of claims 1, 4, 6 or 11.

16. A compressor according to claim 1, wherein the blocking face forms a second sharp edge on an opposite side of the blocking face from the first sharp edge, the second sharp edge connecting the blocking face to a second smoothly curving surface that is downstream of the blocking face.

17. A compressor according to claim 4, wherein the first–discontinuity blocking face forms a second sharp edge on an opposite side of the first–discontinuity blocking face from the first sharp edge of the first–discontinuity blocking face, the second sharp edge connecting the first–discontinuity blocking face to a second first-discontinuity smoothly curving surface downstream of the first-discontinuity blocking face.

18. A turbocharger according to claim 1, wherein the discontinuity is in the form of a groove.

IX) EVIDENCE APPENDIX

NONE

X) RELATED PROCEEDINGS APPENDIX

NONE